

## CLAIMS

### What is claimed is:

1. A coating apparatus for applying a coating liquid to a printing substrate, comprising:
  - a. a rotatable first roll having a surface energy;
  - b. a rotatable second roll having a surface energy, the second roll positioned adjacent to the first roll and defining with the first roll a first nip through which the printing substrate passes, and
  - c. a metering device for applying a layer of coating liquid onto the second roll, which in turn transfers the coating liquid to the printing substrate, wherein the surface energy of the second roll is greater than the surface energy of the coating liquid.
2. The coating apparatus of Claim 1, wherein the metering device comprises:
  - a. a supply of coating liquid in contact with the second roll; and
  - b. a doctor blade contacting the second roll for metering a layer of coating liquid onto the second roll
3. The coating apparatus of Claim 1, wherein the metering device comprises:
  - a. a rotatable third roll contacting the second roll and forming a second nip therebetween,
  - b. a supply of coating liquid in contact with the third roll; and
  - c. a doctor blade contacting the third roll.
4. The coating apparatus of Claim 1, wherein the second roll comprises cast urethane.
5. The coating apparatus of Claim 1, wherein the second roll comprises urethane and a silicone polyol

6. The coating apparatus of Claim 5, wherein the second roll comprises between about 2 and about 7 parts per hundred rubber of a silicone polyol.
7. The coating apparatus of Claim 1, wherein the surface energy of the coating liquid is between about 30 and about 35 dyne/cm.
8. The coating apparatus of Claim 1, wherein the surface energy of the second roll is between about 35 and about 40 dyne/cm.
9. The coating apparatus of Claim 1, wherein at least one of the first roll and the second roll is formed from a material having a sufficiently low hardness to permit the selected roll to conform to the other roll and to ensure contact between the first roll and the second roll along substantially the entire first nip.
10. The coating apparatus of Claim 3, wherein at least one of the second roll and the third roll is formed from a material having a sufficiently low hardness to permit the selected roll to conform to the other roll and to ensure contact between the second roll and the third roll along substantially the entire second nip.
11. A coating apparatus for applying a coating liquid to a printing substrate, comprising:
  - a. a rotatable first roll;
  - b. a rotatable second roll having a surface energy, the second roll positioned adjacent to the first roll and defining with the first roll a first nip through which the printing substrate passes;
  - c. a rotatable third roll contacting the second roll and forming a second nip therebetween; and

- d. a doctor blade in contact with the third roll, the doctor blade applying a layer of coating liquid onto the third roll, the third roll transferring the coating liquid to the second roll, and the second roll in turn transferring the coating liquid to the printing substrate, wherein the hardness of the second roll is less than the hardness of the third roll

12. An ink jet printer comprising:

- a. a housing;
- b. an ink jet printing apparatus, located within the housing, having an ink jet printing device capable of ejecting ink droplets onto a first side of a printing substrate which moves through the housing; and
- c. a coating apparatus spaced from the printing device, the coating apparatus applying a layer of coating liquid onto at least a portion of the first side of the printing substrate; wherein the coating apparatus is positioned before the ink jet printing device and comprises:
  - a rotatable first roll having a surface energy; a rotatable second roll having a surface energy, the second roll positioned adjacent to the first roll and defining with the first roll a first nip through which the printing substrate passes; and a metering device for applying a layer of coating liquid onto the second roll, the second roll in turn transferring the coating liquid to the printing substrate, wherein the surface energy of the selected roll is greater than the surface energy of the coating liquid.

13. A coating apparatus for applying a coating liquid to a printing substrate, comprising:

- a. a rotatable first roll;
- b. a rotatable second roll, the second roll positioned adjacent to the first roll and defining with the first roll a first nip through which the printing substrate passes; and

- c. a metering device for applying a layer of coating liquid onto the second roll, which in turn transfers the coating liquid to the printing substrate, wherein the second roll has a surface roughness of about 0.5 micrometers  $R_a$  or less.
- 14. The coating apparatus of Claim 13, wherein the metering device comprises:
  - a a rotatable third roll contacting the second roll and forming a second nip therebetween;
  - b. a supply of coating liquid in contact with the third roll; and
  - c a doctor blade contacting the third roll and oriented at a contact angle relative to the third roll, the doctor blade having a longitudinal edge that contacts the third roll with a contact force so that a substantially uniform quantity of coating liquid is received by the third roll as the third roll is caused to rotate.
- 15. The coating apparatus of Claim 14, wherein the contact force is sufficient to ensure that the doctor blade remains in contact with the third roll as the third roll is caused to rotate.
- 16. The coating apparatus of Claim 15, wherein the third roll has a roughness of between about 2.4 and about 3.0 micrometers  $R_a$ .
- 17. The coating apparatus of Claim 16, wherein the contact angle is between about 20 and about 30 degrees.
- 18. The coating apparatus of Claim 17, wherein the contact force is between about 0.4 and about 0.5 N/cm.

19. A combination for use in a coating apparatus for applying a coating liquid to a coating substrate, comprising:
  - a. a rotatable first roll having a surface energy; and
  - b. a rotatable second roll having a surface energy, the second roll positioned adjacent to the first roll, defining with the first roll a nip through which the printing substrate passes, and transferring the coating liquid to the printing substrate, wherein the surface energy of the second roll is greater than the surface energy of the coating liquid
20. The combination of Claim 19, further comprising a metering device for applying a layer of coating liquid onto the second roll.
21. The combination of Claim 20, wherein the metering device comprises:
  - a. a supply of coating liquid in contact with the second roll; and
  - b. a doctor blade contacting the second roll for metering a layer of coating liquid onto the second roll.
22. A combination for use in a coating apparatus for applying a coating liquid to a coating substrate, comprising:
  - a. a rotatable first roll having a surface hardness; and
  - b. a rotatable second roll having a surface hardness, the second roll positioned adjacent to the first roll, defining with the first roll a nip through which the printing substrate passes, and transferring the coating liquid to the printing substrate, wherein the surface hardness of the second roll is greater than the surface hardness of the coating liquid.
23. The combination of Claim 22, further comprising a metering device for applying a layer of coating liquid onto the second roll.

24. The combination of Claim 23, wherein the metering device comprises:
- a. a supply of coating liquid in contact with the second roll; and
  - b. a doctor blade contacting the second roll for metering a layer of coating liquid onto the second roll.
25. A metering device for providing a layer of coating liquid to a coating apparatus wherein the coating apparatus has a rotatable first roll and a rotatable second roll defining with the first roll a first nip through which a printing substrate passes, comprising:
- a. a rotatable third roll having a surface energy;
  - b. a supply of coating liquid having a surface energy, the supply of coating liquid being in contact with the third roll, and
  - c. a doctor blade for metering a layer of coating liquid onto the third roll, the doctor blade having a distal edge with a surface energy that contacts the third roll,
- wherein the surface energy of at least a portion of the distal edge is less than the surface energy of the coating liquid.
26. The metering device of Claim 25, wherein the surface energy of the coating liquid is between about 30 and about 35 dyne/cm
27. The metering device of Claim 25, wherein the surface energy of at least a portion of the distal edge is between about 25 and about 30 dyne/cm.
28. The metering device of Claim 25, wherein the third roll is substantially cylindrical, comprises a surface, a first end, an opposite second end and a longitudinal length between the first and second ends, and defines with the second roll a second nip.

29. The metering device of Claim 28, wherein the doctor blade further comprises a first end and an opposite second end, and wherein the distal edge of the doctor blade extends between the first and second ends of the doctor blade and has a longitudinal length.
30. The metering device of Claim 29, wherein the surface energy of substantially the entire length of the distal edge of the doctor blade is less than the surface energy of the coating liquid
31. The metering device of Claim 29, wherein the surface energy of a portion of the distal edge adjacent the first end of the doctor blade and a portion of the distal edge adjacent the second end of the doctor blade have a surface energy that is less than the surface energy of the coating liquid.
32. The metering device of Claim 31, wherein the portions of the distal edge extend at least about 1 cm from the first end of the doctor blade along the longitudinal length thereof and at least about 1 cm from the second end of the doctor blade along the longitudinal length thereof, respectively.
33. The metering device of Claim 25, wherein the at least a portion of the distal edge comprises a coating of silicone wax having a surface energy that is less than the surface energy of the coating liquid.
34. The metering device of Claim 25, wherein the at least a portion of the distal edge comprises a fluorocarbon coating having a surface energy that is less than the surface energy of the coating liquid.

35. The metering device of Claim 25, wherein the at least a portion of the distal edge comprises a coating of Teflon having a surface energy that is less than the surface energy of the coating liquid
36. A metering device for providing a layer of coating liquid to a coating apparatus wherein the coating apparatus has a rotatable first roll and a rotatable second roll defining with the first roll a first nip through which a printing substrate passes, comprising:
- a a rotatable third roll having a surface energy;
  - b. a supply of coating liquid having a surface energy, the supply of coating liquid being in contact with the third roll, and
  - c a doctor blade for metering a layer of coating liquid onto the third roll, the doctor blade having a distal edge with a surface energy that contacts the third roll,
- wherein the surface energy of at least a portion of the third roll is less than the surface energy of the coating liquid
37. The metering device of Claim 36, wherein the surface energy of the coating liquid is between about 30 and about 35 dyne/cm.
38. The metering device of Claim 36, wherein the surface energy of the at least a portion of the third roll is between about 25 and about 30 dyne/cm
39. The metering device of Claim 36, wherein the third roll is substantially cylindrical, comprises a surface, a first end, an opposite second end and a longitudinal length between the first and second ends, and defines with the second roll a second nip.



40. The metering device of Claim 39, wherein the doctor blade further comprises a first end and an opposite second end, and wherein the distal edge of the doctor blade extends between the first and second ends of the doctor blade and has a longitudinal length.
41. The metering device of Claim 40, wherein the surface energy of substantially the entire surface of the third roll is less than the surface energy of the coating liquid
42. The metering device of Claim 40, wherein the surface energy of a portion of the surface of the third roll adjacent the first end thereof and a portion of the third roll adjacent the second end thereof have a surface energy that is less than the surface energy of the coating liquid.
43. The metering device of Claim 42, wherein the portions of the surface of the third roll extend at least about 1 cm from the first end of the third roll along the longitudinal length thereof and at least about 1 cm from the second end of the third roll along the longitudinal length thereof, respectively.
44. The metering device of Claim 36, wherein the at least a portion of the distal edge comprises a coating of silicone wax having a surface energy that is less than the surface energy of the coating liquid
45. The metering device of Claim 36, wherein the at least a portion of the distal edge comprises a fluorocarbon coating having a surface energy that is less than the surface energy of the coating liquid

46. The metering device of Claim 36, wherein the at least a portion of the distal edge comprises a coating of Teflon having a surface energy that is less than the surface energy of the coating liquid.